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Detecting sign-changing superconducting gap in LiFeAs using quasiparticle interference

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Abstract

© 2018 American Physical Society. Using a realistic ten-orbital tight-binding model Hamiltonian fitted to the angle-resolved photoemission spectroscopy data on LiFeAs, we analyze the temperature, frequency, and momentum dependencies of quasiparticle interference to identify gap sign changes in a qualitative way, following our original proposal [Phys. Rev. B 92, 184513 (2015)PRBMDO1098-012110.1103/PhysRevB.92.184513]. We show that all features present for the simple two-band model for the sign-changing s+ - wave superconducting gap employed previously are still present in the realistic tight-binding approximation and gap values observed experimentally. We discuss various superconducting gap structures proposed for LiFeAs and identify various features of these superconducting gap functions in the quasiparticle interference patterns. On the other hand, we show that it will be difficult to identify the more complicated possible sign structures of the hole pocket gaps in LiFeAs due to the smallness of the pockets and the near proximity of two of the gap energies.

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